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ABSTRACT

Scripts of public radic programs on the subject of technology in college are presented. The scripts are as follows: "Dental Videotape:" "A Geography Student Talks About Learning by Computers:" "Linda Harris Talks About Fear of Computers:" "Charles Van Loan, Who Teaches Computer Science at Cornell University:" "Students Who Learn Through Computers:" "Mary Jane Richardson, A Teacher in Kirkwood College's Telenet System:" "'The Heart,' One of 36 Half-Hour Television Programs That Make Up Coastline Community College's Telecourse Called 'Introducing Biology:'" "Leslie Purdy, of Coastline Community College:" "Video Dental Operation:" "Charles Wallace and Howard Mevis, Managers of the Dental School's Media Division:" "Dental Operation:" "Charles Van Loan, Professor of Computer Science at Cornell University:" "Don McTavish, A Professor of Sociology at the University of Minnesota:" "Michael Rice of the Aspen Institute:" "Professor Alfred Bork, at the University of California:" and "Michael Rice." (SW)

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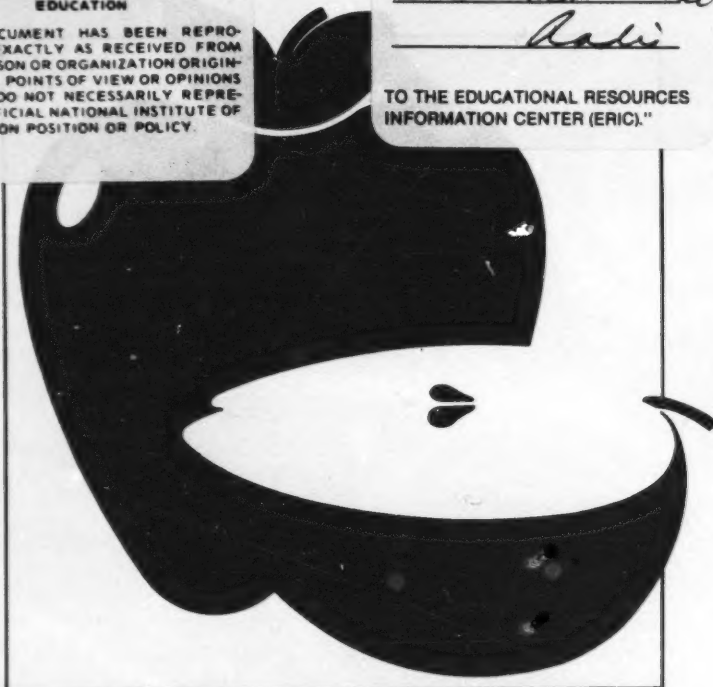
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Program No. 244:

"Technology in College, Part One"

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"TECHNOLOGY IN COLLEGE, PART ONE"

DENTAL VIDEOTAPE

DENTIST: The field here is exposed by retracting the lip, by asking the patient to keep her jaws together, teeth in contact, because we'll be attempting to expose the entire symphysial region of the mandible. We'll do that with a vestibular incision, which will first only go through mucosa. It will -- you'll feel a little pressure here, Sandy, but that's all.

REINHARDT: It hurts just to listen to that.

MERROW: It sounds so real because it's a recording of a real operation.

REINHARDT: Dental students at the University of Michigan study that videotape to learn how to remove an impacted mandibular canine.

MERROW: The dental school has over 1,000 video cassettes in its library, not all as excruciating as that, but all showing students how to do what they'll have to do once they're full fledged dentists.

REINHARDT: Studying videotapes is a lot better than just reading a textbook, and more convenient than crowding around the professor as he works. I'm Barbara Reinhardt.

MERROW: I'm John Merrow, for NPR's Options in Education, with a question: Are colleges taking advantage of modern technology to teach better and to reach more students?

REINHARDT: We'll be back with the answer in a moment. But first, a word from the computer.

(Computer sound)

MERROW: That may not be a familiar sound, because most computer work is done at individual and relatively silent terminals. But computers are everywhere, including on the campus.

A GEOGRAPHY STUDENT TALKS ABOUT LEARNING BY COMPUTERS

STUKEY: I've been told you're drawing the western United States by computer. Is that right?

STUDENT: Yeah.

STUKEY: Couldn't you just draw it on a piece of paper?

STUDENT: This way we are able to do a lot of maps automated, so if we just put the program together we can write a bunch of maps and try all sorts of different, you know, theories and whatnot.

STUKEY: For example.

STUDENT: Well, right now I'm connecting Tacoma with a bunch, you know, of straight lines, connecting it to all sorts of different cities within the west. And now I could also use any of the other cities and connect them up with any other cities, see, so I can automate it and I don't have to, you know, do it by hand.

STUKEY: Did you ever think when you took a geography course that you'd be using computers in it?

STUDENT: Well, when I signed up for this one I did, but originally, when I started taking geography, I never expected anything like this.

STUKEY: Is it worth it, or is it just a gadget?

STUDENT: Yeah, it's worth it, I'd say.

STUKEY: Why?

STUDENT: Well, it saves me time. Originally, when I write the programs, it doesn't, but once I get it automated I can write -- I can make a hundred maps with the same amount of work.

REINHARDT: That student at the University of Minnesota in Minneapolis talked about computers with Mary Stukey of member station KSJN.

MERROW: We don't know, and neither does any computer, how many of our 10-1/2 million college students actually know how to use a computer.

REINHARDT: We don't know of any college anywhere that actually requires every student to become literate in the use of computers, to learn a programming language or to learn how to write a program.

MERROW: Dartmouth College in Hanover, New Hampshire, comes closest. There, 95 percent of the students graduate having had at least one course that requires working with a computer.

REINHARDT: Dartmouth spends \$2 million a year on computers, but only half of that is actually for instruction, the college says. \$1 million goes for the administrative use of the computer system, paychecks, budgets and so forth.

MERROW: We suspect that the primary use of computers on campus is for just that purpose, to run the plant more efficiently.

REINHARDT: Why aren't computers used more often for students or by students? Fear of the computer may be one reason.

LINDA HARRIS TALKS ABOUT FEAR OF COMPUTERS

STUKEY: Did you ever expect, when you first chose sociology, to

be using a computer to do your work?

HARRIS: Oh, no. No, I never even thought that a computer was really a very big part of sociology until I got into it and realized that you have a lot of numbers you have to work with.

STUKEY: How have you felt about that, about using a computer?

HARRIS: Anxious.

STUKEY: Why?

HARRIS: There's a certain amount of anxiety you have to get over with just in confronting this terribly noisy machine, that you have to learn to press all kinds of numbers in the right sequence, and then hope that it works right and deal with the errors when they come up, which are very frequent.

STUKEY: Why are the errors frequent?

HARRIS: Because when you have, like as you see here, these cards that I read in just contain hundreds of numbers and characters, and one little mistake in one character or digit will make the thing blow up.

STUKEY: If you'd known that you'd be standing here punching cards into a computer, would you have gone into Soc.? Were you one of those people with math anxiety?

HARRIS: Yes. I have a high level of math anxiety and I still do, and no, I probably wouldn't have gone into sociology, but as you're an undergraduate and a graduate student too, there's possibilities for jobs in this type of area. You need specialists to run the computer, and although I'm not a specialist, I've picked up some skills which enable me to use it.

STUKEY: So you've gotten over your initial fear of these things?

HARRIS: More or less, yes.

MERROW: That University of Minnesota student, Linda Harris, had to get over her fear of computers on her own.

REINHARDT: If she'd been at Cornell University, she'd have been able to take Charles Van Loan's course in computer anxiety.

CHARLES VAN LOAN, WHO TEACHES COMPUTER SCIENCE AT CORNELL UNIVERSITY

VAN LOAN: The caricature of computer science is, you know, robotics, robots, you know, people that feel they're going to lose their jobs, that, you know, it's very related to math anxiety. People feel that they just

can't think like this, that they don't want to think like a computer, and they seem to think that they might lose their irrationality, or that little dimension that sort of makes you unique and human, if they study the computer.

MERROW: Well, I have to admit to being somewhat afraid of computers. Maybe you could just help me get over computer anxiety, or at least tell me how you would do it if I were in your course.

VAN LOAN: Sure. Well, one thing I do is I don't begin on day one with the programming. I sort of lead into that. I'm very big on the history of computing. I think history, showing people that computation is an intimate part of our culture and has been for thousands of years. You know, I begin with the Babylonians, who had the concept of an algorithm, which is very critical to computer science, and this was, you know, 1,000 years B. C. And just to make people feel that this is not alien, that you know, in your everyday life you do think algorithmically. A recipe is a sequence of instructions which people follow. Certainly geographic directions is a sequence of instructions. A book on etiquette is really a handbook of algorithms to be executed at the appropriate time and place.

MERROW: How are those like computers?

VAN LOAN: Well, in the sense that when you write a program for the computer you are obliged to transform your input to the output by a sequence of very elementary steps, and what's different than, say, writing a recipe for a child, is the precision and the very great detail that you need when you program a machine. So it's really a question of degree. But people certainly are familiar with, you know, step by step procedures, which is what a program is.

MERROW: How soon before I get my hands on a computer?

VAN LOAN: Well, within two weeks students actually start computing, and I make a personal point of, you know, being right there. One thing about my course, you know, it's large. It's about 140 students. But I do get to know them all, and I make a point of being right there when they run that first card deck through the reader.

MERROW: You'd teach me to write a program and then in two weeks I'd get to go run it through the machine?

VAN LOAN: Well, we begin the programming instruction in two weeks. I actually give them programs that we have written to run much before they actually write their first program. Their first program really doesn't come until about the fourth week in the course.

MERROW: What are the common misconceptions? That somehow the computer controls them?

VAN LOAN: Well, I think mainly they feel it's a very alien type of thinking that's required to understand computers, and it is alien and it is different, but I think that's one of the dimensions to liberal education. I think people should be acquainted with this perhaps horrible way of having to describe problems in this tedious, step by step fashion. Now, the aim in our course is not to produce programmers at all. We make no pretense of that, and it's very clear that students can't go out and get a programming job when they finish this one course. It's merely an acquaintance with this type of thinking, learning a little bit of the jargon, so you aren't intimidated by these computer people with all their acronyms and things, just building up a confidence in yourself. And it's very visible, to see that confidence come, and it's mainly because of their programming. The programming is just a portion of our course, but it's a very important portion. Because, you know, when people emerge from college after four years, you want them to be, you know, strong and not afraid of different modes of thought. I mean -- and the more modes of thought that you're afraid of, you're just cutting yourself off from many of the accomplishments that have come about in the last few years.

You know, like many parents throw books in the baby's playpen. That develops a familiarity with books. And certainly if you have terminals all over campus that are easy to use, this builds up a certain familiarity with computers. But you have to go much further than that. When you throw the books into the baby's playpen, the baby does not learn how to read. The baby just perhaps develops an affection for books, which would facilitate the reading instruction later on, but it's not the whole story. And so I feel that, you know, the instruction dimension, not just having the accessible equipment, but the actual instruction, teaching people to read and write perceptively about computers, is really the aim. You certainly need good equipment, and Dartmouth really has superior equipment in that respect. But you have to go much further than that.

REINHARDT: Charles Van Loan, who teaches Cornell University students how to avoid computer anxiety.

MERROW: Use of computers is not limited to math and computer science majors. Liberal arts majors use them as well.

STUDENTS WHO LEARN THROUGH COMPUTERS

STUDENT: I'll be using it in lab work right here in archaeology, but I'm also going to use it in my thesis on political science. It's probably more available in political science literature, that they use the computers. But in doing a report last year on status in burials, it was apparent that a computer would have been really useful and I wasn't able to do that, because I didn't have the time or the knowledge.

STUDENT: This is a program that simulates a parking problem. What

we'll do is run this program several times and then take an average, to see if cars will park themselves in a manner that would be more efficient than if you line the spaces off. So that's what the program is supposed to do. It's not doing it yet. What you do here in the stuff that you learn how to do will be the stuff that you'd be called upon to do when you go to work somewhere. You know, it's the exact same thing. Maybe the systems may be a little bit different, you know, but the same ideas would apply.

STUDENT: There is so much data that it has to handle that the old computers I don't think could handle. And for example, this computer is able now -- we have something called CSMP, which allows us to do integration and to look at changes, small changes over time, and I don't -- at least I didn't know how to use it with the old computers. They may have had the capability, but we couldn't do it then.

MERROW: Students at the Universities of South Carolina and Minnesota, interviewed for Options in Education by Alice Gettle and Mary Stukey.

REINHARDT: Technology means more than computers. It can mean communicating by telephone, with a teacher in one place and the students in another.

MARY JANE RICHARDSON, A TEACHER IN KIRKWOOD COLLEGE'S TELENET SYSTEM

RICHARDSON: All right, I would like to have you call off your names for me today, so that I know everybody that's there for sure. I realize that that means passing the microphone around, but I'd appreciate it, so that I can get my list established once and for all, and so that we here can hear you speak as much as possible. Okay? So if you'll just give me both names, I would appreciate it, everybody who's there.

HERMAN: This is Ed Herman. Jacobs isn't here today. He'll be absent.

RICHARDSON: Okay, thanks, Ed.

MOTT: Blake Mott.

DUREYAN: Don Dureyan.

STEIN: Bill Stein.

BORMAN: Jay Borman.

BERG: Nate Berg.

JORGENSEN: Dean Jorgensen.

STUDENT: That's it.

RICHARDSON: Okay. The most important thing that we'll be doing today, we'll --

MERROW: The teacher is Mary Jane Richardson. She's in a classroom on the campus of Kirkwood College in Cedar Rapids, Iowa.

REINHARDT: The students in her public speaking class, however, are 50 miles away, in a state prison.

MERROW: Class by telephone is better than nothing, but it's awkward. Students have to pass the microphone around. Sometimes the telephone connection is poor, and the instructor and the students can't see each other.

RICHARDSON: I find myself frantically gesturing more, trying to put more feeling into my voice, in a frantic attempt to reach out there, when you can't see them. And as I said, I know that I visualize faces, and I try to get a lot of interaction. I don't talk much more than probably 20 minutes in a solid block, without having to ask for some kind of feedback. Otherwise I have the constant fear that they're gone and I'm talking to the walls, everywhere except the faces in front of me.

YORK: You said earlier that you were basically afraid of new technologies. Do you feel that the staff has really prepared you for the various advances, as each new piece of equipment or each new piece of technology is introduced, that you're pretty much ready for it?

RICHARDSON: I think they've tried. It's very difficult to look at something from another person's point of view, and the things that teachers often are frustrated by is that administrators or people in charge of things are looking at it from their point of view, and so they say, okay, here it is, we've showed you how to do it, now what's your problem. Well, it's that they didn't look at it from the teacher's standpoint, and we don't know what our problems are until we do it. And so many teachers I think have complained and maybe that's been misunderstood. It's our frustration with trying to deliver good things to students. We don't want them to be taken into something and then not respond to it positively. It's very frustrating to me when somebody isn't there to open up a center site, when the system breaks down. I don't like that. I feel somehow that I'm a representative of the institution, and I get very angry at the institution. It's no-one's fault, but in those kinds of ways I guess nothing can be done about that. We just must be more patient, and some of us are less patient.

MERROW: Mary Jane Richardson, a teacher in Kirkwood College's telenet system. Richardson talked with Nancy York of station KCCK in

Cedar Rapids, Iowa.

REINHARDT: Classes by telephone are not on the cutting edge of technological change.

MERROW: The same thing can be done better by adding a visual image.

REINHARDT: What teleconferencing does, whether by sound alone or with pictures, is increase the number of places you can go to take a course. It doesn't free you from the necessity of going somewhere.

MERROW: That's probably its achilles heel. It's still place bound and time bound. Students have to be in a certain place at a certain time to take the course.

REINHARDT: But if you have a television, and 96 percent of homes do, classes can come to you. You can study in your living room.

"THE HEART," ONE OF 36 HALF HOUR TELEVISION PROGRAMS THAT MAKE UP
COASTLINE COMMUNITY COLLEGE'S TELECOURSE CALLED, "INTRODUCING BIOLOGY"

INSTRUCTOR: What you're watching is a heart. It's beating in a rabbit embryo. Just like the human embryo, the heart is the very first organ to form after conception.

MERROW: "The Heart," is one of 36 half hour television programs that make up Coastline Community College's telecourse, called, "Introducing Biology." Students watch the program, read the textbook, take tests and get college credit.

REINHARDT: Coastline has about 20 courses with titles like, "Contemporary Health Issues," "Family Portrait," and, "Project Universe."

MERROW: Coastline Community College has no campus. It's part of California's Coast Community College District, which also includes public TV station KOCE.

REINHARDT: More than 30 other colleges have joined with Coastline to offer credit for television courses. Nearly 300,000 Californians have taken courses for credit since 1970.

MERROW: Are TV courses the best way for students to get college credit? How about the cost? Leslie Purdy, of Coastline Community College.

LESLIE PURDY, OF COASTLINE COMMUNITY COLLEGE

PURDY: I haven't seen any cost effectiveness studies yet that showed that television courses on a per student basis were any more

expensive than on-campus courses. You have to realize that a television course may have an initial price tag that's very high, 500, \$800,000.00, but if that course is then viewed by or taken by 40 or 50 or 60,000 students over a four or five year period of time, you're talking about saving local institutional costs, you know, over that same period of time.

The whole success to telecourses being cost effective is in mass viewing, mass audiences. It -- I think the other reason why it has to be seen as a viable public activity right now for educational institutions is that it's serving a group of students who are not being reached by on-campus programs. A lot of the information we get from students is that they would not have gone back to school to take this course, because school was either -- it was offered at the wrong time of day, or for instance with housewives, they couldn't get the baby sitting, and that made it to expensive for them, but because of the convenience of time and location they were able to take a course and get credit from a higher education institution that they wouldn't have done otherwise. So I think both the fact that it's -- television courses are taken by a large number of people over a long period of time, and the fact that were serving and reaching a whole new group of adults, makes it just of primary importance for higher education and public television to be looking at now.

LAUTERBACH: Do you think that partly colleges and universities would get interested in offering TV courses because of dwindling enrollment?

PURDY: That is one motivation, definitely. I think another is just that we're beginning to appreciate so much more the learning differences in our students, learning differences sometimes caused by age, and others just by styles of learning. There are many on-campus students who would prefer to take certain courses using a more visual medium than listen to a large group lecture in a university hall. Many undergraduate courses on our biggest campuses now certainly can't claim to have much personal contact between the faculty member and the student, any more than there's personal contact in a television course.

LAUTERBACH: Is there a way now that a student could get a degree just through television courses?

PURDY: The Chicago City Colleges tried that experiment a number of years ago, actually in the middle '50s, with their Chicago TV Colleges, and they do have records of several hundred students who completed their A.A. degrees via television. They have records of -- I think it's in the thousands more, who completed their A.A. degrees taking some of the courses by television and the rest on campus. I'm not aware presently of any school that offers a whole A.A. degree curriculum via television. For one thing, that would take such an incredible number of courses, and there just aren't that many good quality contemporary television courses available yet around the country.

MERROW: Leslie Purdy of Coastline Community College, which offers about 20 courses a year by television. She was interviewed for Options in Education by Chris Lauterbach.

REINHARDT: At least two other areas rival Coastline for the title of most prolific producer and broadcaster of television courses. Dallas Community College and Miami-Dade Community College in Florida.

MERROW: Miami-Dade prepared the study material for the television course, "The Ascent of Man," so far the single most popular TV course. Over 25,000 people got credit for that course at different colleges around the country.

REINHARDT: Courses by television come into the home, thus solving the problem of travel. They are not place bound.

MERROW: But unless you have a video cassette recorder, and they're expensive, courses on television are time bound. "The Heart," or, "The Ascent of Man," comes on at a single, specific time, and you've got to be there.

VIDEO DENTAL OPERATION

INSTRUCTOR: Now, with the mucosa divided, I'm bluntly extending the sub-mucosal dissection in this manner, and we will then later make a trans-muscle secondary incision. That secondary incision now -- let's have a sponge in here and we'll dry the field a little bit more, and before we make a secondary incision to the periostium.

MERROW: You've probably heard enough, but if you were a dental student you'd want to keep watching and listening, and you might want to replay it.

REINHARDT: That's easy to do at the campus library, in this case at the University of Michigan.

MERROW: Reporter Michael Groffsoresan watched the video cassette of the operation, then talked to the managers of the Dental School's media division, Charles Wallace and Howard Mevis.

REINHARDT: Wallace and Mevis told him that the library has 1,000 different video cassettes and is making more. They say faculty and students are enthusiastic about the cassettes.

CHARLES WALLACE AND HOWARD MEVIS OF THE DENTAL SCHOOL'S MEDIA DIVISION

WALLACE: After viewing a procedure on television, many of the questions that a student would have are answered, and those that are not answered, they can go to a faculty member and get a direct answer to that direct question, and the faculty member does not have to raise

the student up to a certain level of consciousness about the topic or about the subject. The student comes to the faculty member and says, "This is my problem." The faculty member answers that problem. So the quality of the interaction between the student and the faculty member is greater than it has been before. And we think that the student-faculty interaction has been enhanced because of television. I think that you can certainly teach a lot of things through just, let's say, a traditional 60 minute lecture, where the faculty member sits and talks to a class, with maybe a series of slides, and tries to teach a procedure. Television has the ability to do that, let's say in 20 minutes.

GROFFSOREAN: And why is that?

WALLACE: Well, there are certain things you can do in terms of editing things, condensing things, making things more succinct, that you can do with television that in a lecture format people tend to ramble, let's face it. We've all sat through lectures where an instructor will sit there and they love to go through a certain discourse about their favorite subject, and television has a way of cutting those things out.

GROFFSOREAN: What can you do with TV that you can't do with a demonstration?

WALLACE: Well, the object is that television records that demonstration. If they're cutting a prep on a patient or if they're cutting a prep on a model, television has a way of providing an equal and optimal view for each student. They don't have to huddle around an instructor's shoulder or rely on his narration about what he's doing in the front of the class. Each student, regardless of where they are, if they have a television monitor in the lecture room, or if they're doing it on an individual basis, they have the same view, so they all can see it, and that's important.

MEVIS: As a sidelight, on some occasions when practicing dentists have reviewed material that we've developed here within the school, they lament that they wish the material had been available when they were going to school, and half in jest some of them have mentioned that the view that we provide through television is better than they perhaps can see in their own practice. So I think that's a positive statement about television.

WALLACE: I think also another challenging thing is to really produce the material so that it goes just beyond the point of instruction that students are not bored by the time they spend using television. In fact you might say that the television is -- the production is a little bit entertaining for them. Not that it's humorous or it's song and dance or anything like that, but there's visual variety, shots are framed properly, editing transitions are

done correctly, the flow of the program, that when you watch it, it doesn't -- hey, you can't say, "I've spent 20 minutes doing that," and wonder where all the time has gone. But to really make the programs interesting beyond instructional. I mean that's our primary purpose, to be instructional, but to add a little bit of interest in terms of the way it's produced.

REINHARDT: Charles Wallace and Howard Mevis, of the University of Michigan's Dental School. They manage the media division. Students can go there any day of the week to watch videotapes.

MERROW: But videotapes still haven't licked the problem of instructions being place bound. After all, few students can afford a video cassette player. They still have to go to the library or learning center to view the tape.

REINHARDT: Can technology be free of the constraints of place and time? Can instruction be delivered where you want it whenever you want it, and at low cost?

MERROW: Are colleges dragging their feet in striving for that goal?

REINHARDT: Those two questions and some answers on the next Options in Education.

DENTAL OPERATION

INSTRUCTOR: The attachment at the interior border of the mandible tends to be quite tenacious, and I'm going to use a small curette here, to a little more sharply dissect the periosteum from around those rather tendinous muscle insertions. Now, we can see here, I believe, at this point, that the cortex is entirely intact, and we have a good field of exposure, and we should be able then to remove the bone from this area and with a drill, and discover well below the apices of these other teeth, the crown of that impacted cuspid.

MERROW: This is Part 5 of our six part report on colleges, which includes programs about cheating, money and advertising. The printed transcript of all six parts costs \$6.00.

REINHARDT: The cassette recordings are available for \$18.00.

MERROW: Write to us at National Public Radio - Education, Washington, D. C. 20036.

REINHARDT: The printed transcript, \$6.00. The cassette recordings, \$18.00.

MERROW: And our address again, National Public Radio - Education,

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MERROW: Support for the series is provided by the National Institute of Education and the Corporation for Public Broadcasting.

REINHARDT: Options in Education is written and produced by John Merrow. Mary Rouse is our associate producer. Rebecca Goldfield is our assistant producer. Our engineers are Dave Glasser, John Widoff, Renee Pringle, Mary Ishnaga and Bill Heineman of station WSKG in Binghamton, New York.

MERROW: Some of the material for this program came from Michael Groffsoorean in Detroit, Chris Lauterbach in Los Angeles, Mary Stuky of KSJN, Minneapolis, Nancy York, station KCCK, Cedar Rapids, Iowa, Mary Anne Blake, WVPR, Windsor, Vermont, and Alice Gettle, WLTR, Columbia, South Carolina. I'm John Merrow.

REINHARDT: I'm Barbara Reinhardt.

MERROW: This is NPR, National Public Radio.

Program No. 245: "Technology in College, Part Two"

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"TECHNOLOGY IN COLLEGE, PART TWO"

(Computer sounds)

MERROW: What you hear are sounds of a computer.

REINHARDT: Computers are commonplace in society, part of the technological revolution.

MERROW: Probably every one of the 3,000 colleges in the country uses computers, if only to manage the physical plant and keep track of expenditures.

REINHARDT: Some colleges use computers for teaching, particularly in the sciences.

MERROW: Other forms of new technology, like video discs, video cassettes and cable television, lend themselves to educational uses. But is education ready for them? I'm John Merrow.

REINHARDT: I'm Barbara Reinhardt, for NPR's Options in Education, with a report on colleges' use and avoidance of technology.

MERROW: Let's begin with computers.

CHARLES VAN LOAN, PROFESSOR OF COMPUTER SCIENCE AT CORNELL UNIVERSITY

VAN LOAN: I would say -- this is based on experience -- that the biggest retarding force to increasing computer literacy on campus is the faculty. Now certainly equipment's expensive and there's always a pinch on the financial end, but really the one thing that stands between the state of affairs now and more widespread computer literacy efforts on campus is the faculty.

REINHARDT: Charles Van Loan is Professor of Computer Science at Cornell University.

VAN LOAN: Suppose you're a Professor in some -- an Assistant Professor, say, in some area, say English, and maybe you want to introduce computers in a course, or maybe you're doing some research that will involve computers. You know that the people who are eventually going to evaluate you are not familiar with computers and might look askance at you, it sort of might have a chilling effect. Now, that's one dimension. Certainly the faculty now -- you know, computer instruction in college never really got off the ground until the mid-60's, say. You know, like many of the professors there now never were trained at all in this, and it's -- you know, it is alien and they're afraid of it.

MERROW: Well, I would say that it hasn't really gotten off the ground yet in a lot of places.

VAN LOAN: Well, that's right, and that's what makes it exciting, it's a real battle. But I think as computers get easier to use, you know, the hardware gets cheaper and the software becomes much more readily used, then a change will come. It'll be very, very slow. This is why I feel direct appeals to students -- the students sense the importance of this much more than the faculty, and so to speak one can go around this kind of resistance just by being loud and noisy.

MERROW: You're doing an end run on the faculty.

VAN LOAN: That's right. I don't want to -- it's not malevolent on their behalf, but they have their own interests. And not only that, but I mean it takes time. See, everybody's time -- no-one has time, and to sit down and figure out how computers can be used in your course is a tremendous investment, which by no means may not pay off, you know, and why risk it. People say, "I've been teaching this course for 20 years and never used computers. Therefore, you know, why change?"

MERROW: And maybe you're also sort of assuming that college tomorrow will be the same as it is today and the same as it was yesterday.

VAN LOAN: I'm sure that people do assume that, but they're wrong. One of the things that will change is the number of college students. We're in for a 20 percent decline. Different departments are competing for students because, you know, in the end, you know, you can justify faculty positions by the number of students you have. And there is yet another reason for perhaps pushing computing in the background, because, you know, if a student takes my course that means he doesn't take someone else's course, right? All's fair in love and war.

MERROW: Oh, I'd like to hear all about that.

VAN LOAN: Well, again, it's not malevolent. I'm saying this is implicit, and everyone believes that what they are doing is at the epicenter of undergraduate education, and one corollary of being in computer science is our courses keep getting bigger and bigger.

REINHARDT: Charles Van Loan of Cornell University. He teaches a course in avoiding computer anxiety. Perhaps professors are nervous or too busy, but they may find themselves left behind. Don McTavish told reporter Mary Stukey that more and more students are familiar with computers when they enter as freshmen.

DON MC TAVISH, A PROFESSOR OF SOCIOLOGY AT THE UNIVERSITY OF MINNESOTA

MC TAVISH: Often we'll have students come in from high school who have used mini-computers, where we are only attempting to develop that kind of lab right now.

STUKEY: You mean high schools are often ahead of universities?

MC TAVISH: Not only high schools, but grade schools. It is a sometimes thing, of course, but the better grade schools have given students experiences that they should have at that level, but experiences that many students, even when they get into college can't have, because we don't have the proper labs or equipment to support that kind of training.

REINHARDT: Don McTavish, a Professor of Sociology at the University of Minnesota in Minneapolis. Not all professors are hiding their heads, nor are all college administrators refusing to buy equipment. Some colleges are experimenting with new technology, using it to improve instruction on campus or to reach more people off campus. But by and large, we're told, colleges are not in the forefront of the educational technological revolution. They're using technology in obvious ways, television courses, videotape demonstrations, computer programs in courses requiring drill. In this program we'd like to explore why colleges appear to be dragging their feet, and what might happen to them if they continue dragging their feet.

MERROW: Michael Rice used to work in what was called educational television, on one of the early TV courses, "The 21 Inch Classroom." Bringing college courses into the home sounds great, but they're fixed in time.

REINHARDT: That is, the program comes on at a certain time, like 6:30 in the morning, whether or not you're ready to watch. Michael Rice.

MICHAEL RICE, OF THE ASPEN INSTITUTE

RICE: There are some possibilities to break the barrier of fixed time scheduling and all of the inconveniences that it imposes on the student. One possibility is to forget electronic distribution by wire or broadcast altogether, and instead to distribute telecourses or other such materials on video discs, which will soon come into widespread use, many people predict, or on video cassettes, which give the power right to the absolute minute and setting, to the individual, the power to decide when to view, when to stop the program in mid-course to do something else. You can use it as a personal medium rather than as something that you have to attend to at a time or in a way of someone else's choosing.

Now, I could imagine a hybrid system of the future, where students, like some million families today, would have video cassette recorders with timers, and certain hours, particularly in cable systems that have the capacity, would be designated as delivery times for a given telecourse lesson, where you at home might not be able to watch just then or wouldn't want to, but your machine would be timed to

record it, and then you would have created that lesson in a form that you could use that week, entirely at your own command, and then wipe it the next week when the succeeding lesson comes down the line.

The problem with a system of that kind is that it requires a good deal of attention on the part of the individual, to getting everything organized, to make sure the timer is set and the tape is on and all the rest, and the more trouble you create in that sense, the more steps a person has to go through, the harder it is to make sure it works every time. The convenience value is lessened. Whereas, if you have a -- let's say a video disc delivered, already pre-programmed at a reasonable cost that you can use any time you like, or you can rent them, then it's just that much easier to be sure that you have what you need and to have it when you need it.

MERROW: Let's talk about the cost, though. First of all you need the machine to play it on. Then you've got to buy the discs. Each disc may be an hour, may be two hours, but you're going to spend a lot of money, a lot more than you would on textbooks if you signed up for the course at a community college.

RICE: Well, I'm not so sure. The new video disc players, we're told by their entrepreneurs, might market retail for around \$500.00. I'm not sure what the textbook costs are for college courses these days, but I can remember in my own case spending as much as 50 or \$60.00 per course, and if a set of discs, adding up to a course were available on a rental basis, or if such a large volume of a given college course is issued that the unit course for each buyer are really quite low, then I would think that the prices are comparable. In any event, the cost of pursuing higher education is supported in all sorts of ways nowadays, not only by the student or consumer, but also by the providers and by government agencies that are committed to extending the benefits of education to many people. So it's not possible to say just what the cost to the end user will be by these various alternatives. A lot will depend on matters of public policy in this regard.

MERROW: But what you're saying is that new technology is going to free people of the oldtime constraint, go to a classroom at a certain time or turn the television on at a certain time, and that is a revolutionary step, and I think you're also saying that colleges and universities may be out of step.

RICE: Well, they may be out of step, because you could ask yourself who needs them. If a video disc course or a video cassette course or a telecourse delivered by cable could be developed by a software program provider, together with an individual professor or author, much as textbook companies today deal directly as a rule with authors and professors, not with their institutions, and if people don't care very much about getting the degree or the credit for the

course, but simply for the material that is in it, a big challenge to the colleges and universities will be how to get in on the act. Now will they convince people that they have something to offer besides that will enhance the learning experience, or that will be so valuable to the students that some part of the money that exchanges hands for this service will end up with them. Now, typically, the diploma or the degree or the credit has been one of the things that colleges and universities have had to offer in order to command tuition payments and attendance, and that may still be important for adult learners in the future, particularly those who are just trying to finish enough credits to complete a college degree that they might not have finished when they started out in the conventional way. But much that we know about adult education today suggests that it's always a minority that's really interested in credit, that many of them are pursuing subjects according to personal interest or for job advancement or for hobbies, and for them the particular credit or degree doesn't mean anything.

On the other hand, there may be values of personal face to face instruction, or the kind of learning that comes from peer association, or laboratory experiences, or performance opportunities, courses in the arts, where a college or university, somehow in association with a course delivered by television, could offer that extra dimension that makes it more of a formal learning experience, and in that case colleges and universities I think would be seizing on these distribution media as a way to extend their reach, to enroll people and have some classroom or laboratory or concert hall attendance, but not so much as would be required of a conventional student who did not also have the television delivery of certain of the lessons or programs that were part of the course.

MERROW: You and I both went to a meeting where we heard one particularly high mucky-muck in the whole business of higher education and so on, say that students want to go to college, they value that four years of social life and so on. Does that attitude strike you as one of someone who's ready to embrace the new technology and change as required?

RICE: Well, there is something special to the residential four year college experience, and I don't think anyone is suggesting that just because a multiplicity of television distribution channels seems to be taking shape that this as a factor will put formal higher education out of business. Remember that many people who do go to college in the full time sense are still in adolescence or late adolescence, and the discipline, the structure that the college experience gives them guarantees their working and getting through it in a way that relying solely on their self-starting motivations might never do.

REINHARDT: Michael Rice of the Aspen Institute. He's Director of the Institute's program on communications and society.

MERROW: Perhaps Rice is correct that lots of students, particularly ones in the traditional college age group, 18 to 24, will continue to prefer the face to face communication, the interaction and the social life on campus.

REINHARDT: Still, the next generation is growing up with computers and other technology. These kids may not be satisfied with the traditional lecture method of instruction.

PROFESSOR ALFRED BORK, AT THE UNIVERSITY OF CALIFORNIA

BORK: This is a statistics quiz. We're developing some statistics quizzes, and it's saying what the mean is. Let's put in our bad answer. And you see it tells me it's a wrong answer. But furthermore, not only that, it's going to give me some assistance with it.

LAUTERBACH: You should have the mean --

BORK: And here's a definition --

LAUTERBACH: -- of the values, divided by the number of items.

BORK: So it's trying -- it's giving me a little more help in that it's telling me what the mean is. It's not going through and doing the operation for me yet. Eventually, if I keep missing it'll do it for me, as a rule, it would show me how to do it. So it's not like a written test where a student takes it and then a few days later they get back a marked up paper. Here you get instant response on every question, and one of the real advantages of the computer is that kind of interaction, that kind of immediacy, and also that kind of individualization, because the response can be appropriate to exactly the errors, exactly the problems that that particular student's having, and it's hard to do that in large classes, or I think it's really almost impossible to do that in large classes by any other kind of mechanism.

REINHARDT: If college students are fortunate, they'll have teachers like Alfred Bork, Professor of Physics and Computer Sciences at the University of California at Irvine. He talked with Chris Lauterbach.

BORK: It took almost 200 years from the invention of the printing press until the time textbooks were widely used in schools, and that 200 years represented a sort of development time where people had to learn what a book was good for, in terms of aiding learning. And likewise, much of what we've done in the past few years has not been really the production of final material, but the understanding of the capabilities of the computer, as an assistance in learning.

LAUTERBACH: What kinds of learning are done better with computers than in a traditional classroom?

BORK: Well, first of course the computer gives you a way of dealing with large numbers. It's obviously good where you need rote information, although many university classes would claim that they don't do much rote information. It's very good, we believe, in teaching problem solving. It's very good in building up student intuition. In many places its role is simply to take what was previously a passive kind of learning and to convert it into an active learning. A student who sits in a big lecture class and watches an instructor go through a complicated mathematical development on the board without that student doing anything, is in a very passive learning situation.

If, on the other hand, the student is actively trying to do it, actively trying to create the derivation, create the proof, and the computer keeps giving him advice, aid and assistance along the way, but letting the student be the real governor as to what's done and how fast it's done and so forth, then that passive classroom situation can become an active situation, and not just for the better student, but for almost all the students in the class. I would say where you have -- where value judgments play a major role, and where mathematical modeling plays a minor role are areas where the computer -- where it's harder to see how to use the computer. On the other hand, even in the humanities often you need drill, that is someone learning a language needs drill in vocabulary, grammar, et cetera, and the computer is a great device for providing unlimited amounts of drill, tailored to the level of whoever is involved with it.

LAUTERBACH: Are universities and colleges around the country keeping up with computer technology now, in terms of using it as a teaching device?

BORK: There's always a lag, I think. It's sort of natural. The computers in universities came into universities through the needs of research, and then later through the needs of university administrations. And still when most universities look at computing on their campus realistically, most of the usage of computer facilities are in research or in administration. There are relatively few campuses where the educational uses are dominant, but that is changing as more and more campuses are moving in that direction. And one of the things that makes it easy to change now is the -- and really it's a technological development of just the last two or three years -- is the development of the small, independent, stand-alone computer, the kind of computer that I like to call the personal computer, because it's used by a single individual. It's hard to tell exactly how many of them, but perhaps half a million to a million have been built in the last three or so years. Estimates are that that will increase greatly. There's a study at USC that's predicting that there may be as many as 60 million home personal computers by 1990. That's three out of every four American homes. If that's the case, then universities will probably be dragged, kicking and screaming, into the computer area,

because everybody will have them at home and universities will have no choice, as the students who come will feel the university is inadequate unless they provide that kind of capability.

LAUTERBACH: What is the resistance to developing the use of computers in universities, in teaching?

BORK: Well, I think the primary resistance is just that universities, although they sometimes like to view themselves in other ways and faculty don't like to view themselves this way, are extremely conservative institutions when it comes to their own ways of doing things. For most faculty members the way it's been happening in the past is adequate. After all, it worked for that faculty member. That is that faculty member was a success of the system. What that faculty member often doesn't notice is that there are a lot of people who are not successes of our current system, who are very poorly treated by it. But given that the men who make the decisions are the ones who are the successes of the previous system, that's an inherently conservative mechanism, as faculty tend, therefore, to be conservative individuals, even if they view themselves as flaming radicals. You can see this in faculty politics where what often passes for instruction improvement is nothing but minor window dressing. Most faculties will find a variety of safe issues, issues that don't really matter, such as whether you're running on a quarter system or a semester system, or whether you give five grades to students or eight grades to students, with pluses and minuses. Issues like that are almost trivia. I think they're sort of safe, because inherently the people who argue them know that it doesn't really matter which way you do it, that it has almost no consequence on the learning of students. So faculty are conservative.

We think that changes, when they come, are going to come primarily from outside forces. That is such things in California as the effects of Proposition 13 and now Proposition 9, and general public unhappiness with education, general -- the universities are not going to change in their own right. They're going to change because outside pressures will demand it.

REINHARDT: Alfred Bork, Professor of Physics and Computer Sciences at the University of California at Irvine. He was interviewed for Options in Education by Chris Lauterbach.

MERROW: Adult learners who are more interested in taking a course than in getting degree credit for it, inexpensive video discs and cassettes, two way television, the availability of computers in the home. What will happen to traditional colleges? What should they do to stay in business?

REINHARDT: Michael Rice of the Aspen Institute's program on communications and society.

MICHAEL RICE

RICE: For the small college the great virtue of materials that can be committed to television form of one sort or another is that it can maintain a breadth of curriculum offerings, even in a small institution, without the necessity of having on the faculty one person for every imaginable subject specialty, that the faculty can have its strengths and its generalists, and can then, often by its own choice, supplement the offerings and enrich them with materials that can be obtained in film or television form, just as any faculty of course draws on books and textbooks and other materials, in order to enrich the offerings that it can make. So it may be that these new media will be a kind of lifesaver for the small institution which is suffering from shrinking enrollment and rising costs, in that it can keep from becoming too narrow, even with a small faculty, by relying on that faculty to expand its breadth through the use of materials delivered in television form.

MERROW: It's interesting, because your advice then is use the new technology to make life better for the students you already have on campus. You're not saying anything about reaching out to get new people.

RICE: No, you asked about the small four year college, and it seems to me the mission of the small four year college is to make the most valuable educational experience for its students on campus.

MERROW: Do you want to be president of a major state university for a minute?

RICE: But if you are president of a major state university or something like New York University, here in New York City, with its sprawling appeal to adult students from New Jersey and the various boroughs of New York and all the rest, then the answer is one that has to do more with outreach. That is to add a convenience factor to the course offerings you make to people, and at the same time not to offer something so valuable in terms of what your institution can provide that a person will want to enroll, will want to take that telecourse and all the convenience that comes from being able to attend it at home at a time and in a setting of one's own choosing. But not -- but you have to strike a balance here. Don't give the impression that that's all the student needs. Be sure to underscore the value of that occasional visit to the institution itself for class discussion or for performance or for a laboratory experiment, and if credit is a question, for examination and accreditation in the course. So that there will still be perceived a need for the institution that's sponsoring the course.

MERROW: That's a tougher tightrope to walk.

RICE: I think so, yeah, particularly as we see in further

education programs that people aren't so concerned with credit as they are with simply the subject they happen to choose that might be of interest to them or important to their job. It really forces the university with its big commitment in plant, libraries, classrooms, laboratories and its big commitment to a standing faculty, to distinguish what it peculiarly and attractively offers in terms of the face to face experience that will draw a student into its precincts, as opposed to what can be offered and provided, often with, you know, great appeal, on television. Rather than compete with television's presentation features, a university might ride piggy back on them, as many community colleges did with the Ascent of Man series, making clear that it will then provide in its classrooms or laboratories or by correspondence courses or by telephone consultation or by computer connections, the feedback, the personal instruction, the questions and answers, the individual attention, the personality and inspiration of a living teacher, which no conventional television series or telecourse can offer.

REINHARDT: Michael Rice of the Aspen Institute, with his recipe for colleges' survival in a technological revolution.

MERROW: Speaking of technology, we have cassettes of this six part series on colleges. Besides technology the series includes cheating, paying for college and the marketing of colleges. Cassette recordings cost \$18.00, and you can listen to them wherever or whenever you want.

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in Binghamton, New York. some of the material for this program came from Chris Lauterbach in Los Angeles and Mary Stukey in Minneapolis. I'm Barbara Reinhardt.

MERROW: I'm John Merrow, and this is NPR, National Public Radio.